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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/822,775	03/30/2001	Bahram Javidi	UCT-0017	6972

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EXAMINER

PYZOCHA, MICHAEL J

ART UNIT	PAPER NUMBER
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2137

DATE MAILED: 07/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/822,775	Applicant(s) JAVIDI ET AL.	
	Examiner Michael Pyzocha	Art Unit 2137	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2005.
- 2a) ☒ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 143-160 is/are allowed.
- 6) ☒ Claim(s) 1, 4-8, 11-14, 17-21, 24-28, 30, 46-49, 54-59, 62-66, 69-72, 75-79, 82-84, 88-90, 113 and 114 is/are rejected.
- 7) ☒ Claim(s) 29, 31-45 and 50-53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continuation of Disposition of Claims: Claims pending in the application are 1,4-8,11-14,17-21,24-59,62-66,69-72,75-79,82-84,88-90,113,114 and 143-160.

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DETAILED ACTION

1. Claims 1, 4-8, 11-14, 17-21, 24-59, 62-66, 69-72, 75-79, 82-84, 88-90, 113, 114 and 143-160 are pending.
2. Amendment filed 06/08/2006 with a supplemental amendment filed 06/09/2006 has been received and considered.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 1, 4, 8-14, 17, 21-28, 30, 46-47, 54-59, 62, 66-72, 75, 79-84, 113-114 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson in view of Heanue et al (US 5940514) in view of Yamaguchi et al (Phase-shifting digital holography) and further in view of Rentzepis et al (US 5325324).

As per claims 1, 4, 8, 14, 17, 21, 46, 47, 57-59, 62, 66, 72, 75, 79, Jackson discloses generating an original set of data; generating a reference set of data; encoding the original set of data; encoding the reference set of data; combining the original set of data with the encoded reference set of data to generate an encrypted set of data; storing the encrypted set; and decrypting the set of data (see column 10 lines 40-57 and column 6 line 11 through column 7 line 4 and figures 2A, 2B, 5A and 5B) the encoding of the data comprises phase encoding (see

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column 10 lines 40-57 and column 6 line 11 through column 7 line 4) and recording the encrypted set of data in a hologram (see column 11 lines 10-28)..

Jackson fails to disclose the original set is a 3D input scene with multiple perspectives, the encoding of the data comprises phase encoding by introducing a random phase into the data and introducing the random phase using the equation:

$$U_r(x,y;\Delta\phi_p)=A_r(x,y)\exp[i(\phi_r(x,y)+\Delta\phi_p)].$$

However, Heanue et al teaches such multiple perspectives (see figure 1, column 2 lines 33-54 and column 8 lines 44-56), Yamaguchi et al teaches such an equation (see page 1268) and Rentzepis et al teaches random phase encoding (see column 18 lines 29-42).

At the time of the invention it would have been obvious to a person of ordinary skill in the art for multiple perspectives, Yamaguchi et al's equation and Rentzepis et al's phase encoding to be used in the system of Jackson.

Motivation to do so would have been to provide an encryption method that does not degrade the performance of the holograph storage system (see Heanue et al column 2 lines 19-30), to be able to reconstruct a cross section with higher image quality (see Yamaguchi et al page 1268) and because random phase

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encoding is highly accurate (see Rentzepis et al column 18 lines 29-42).

As per claims 12-13, 25-26, 70-71, 83-84, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system discloses the original and reference set of data comprises an optical image, a digitized image, a one dimensional set of data, a two dimensional set of data, a multi-dimensional set of data, an electrical signal or an optical signal (see Jackson column 11 lines 10-28).

As per claims 11, 24, 69, 82, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system discloses recording the encrypted set in a hologram according to the

$$I_p(x,y) = [A_H(x,y)]^2 + [A_R(x,y)]^2 + 2A_H(x,y)A_R(x,y)\cos[\phi_H(x,y) - \phi_R(x,y) - \Delta\phi_p]$$

wherein p is an integer,

$$\phi_E(x,y) = \phi_H(x,y) - \phi_R(x,y)$$

is the encrypted phase,

equation: $A_E(x,y) = A_H(x,y)A_R(x,y)$

Is the encrypted amplitude \square . \square_p is a phase shift between the reference set of data and the original set of data $[A_H(x,y)]^2$ is

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the intensity of the original set of data and $[A_R(x,y)]^2$ is the intensity of the encoded reference set of data (see page 1268).

As per claims 27, 28, 30, 54-56 the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system discloses generating decryption keys (see Jackson columns 9 and 10).

As per claims 113-114, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system discloses reconstructing the original set (see Jackson column 11 lines 10-28).

5. Claims 5-7, 18-20, 63-65, 76-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system as applied to claims 1, 14, 59, 72 above, and further in view of Tan et al (Secure optical storage that uses fully phase encryption).

As per claims 5-7, 18-20, 63-65, 76-78, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system fails to disclose the encoding of the data comprises amplitude encoding by introducing a random amplitude into the data and introducing the random amplitude using the equation:

$$U_R(x,y;\Delta\phi_p) = A_R(x,y)\exp[i(\phi_R(x,y) + \Delta\phi_p)].$$

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However, Tan et al teaches amplitude encoding (see page 6689).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the encoding techniques of Tan et al in the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system.

Motivation to do so would have been that amplitude encoding is one of the degrees of freedom in which an optical beam may be encoded (see Tan et al page 6689).

6. Claims 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system as applied to claim 47 above, and further in view of Schnars et al (Direct recording of holograms by a CCD target and numerical reconstruction).

As per claim 48, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system fails to disclose reconstructing of the original set of data from the decrypted digital hologram comprises generating the discrete complex

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amplitude distribution of the reconstructed original set of data

$$U_o(m',n') = \exp\left[\frac{-i\pi}{\lambda d}(\Delta x'^2 m'^2 + \Delta y'^2 n'^2)\right] \sum_{m=0}^{N_x-1} \sum_{n=0}^{N_y-1} U_o(m,n) \\ \times \exp\left[\frac{-i\pi}{\lambda d}(\Delta x^2 m^2 + \Delta y^2 n^2)\right] \exp\left[-i2\pi\left(\frac{m'm}{N_x} + \frac{n'n}{N_y}\right)\right]$$

wherein $U_o(m,n)$ is the discrete amplitude distribution of the decrypted digital hologram, m and n are coordinates in the plane of the hologram, m' and n' are coordinates in the reconstruction plane, Δx is the horizontal resolution in the hologram plane, Δy is the vertical resolution in the hologram plane, $\Delta x'$ is the horizontal resolution in the reconstruction plane, $\Delta y'$ is vertical resolution in the reconstruction plane, N_x is the number of detector pixels in the x direction and N_y is the number of detector pixels in the y direction.

from the equation:

However, Schnars et al teaches such a limitation (see page 180).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to reconstruct the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system's information as in Schnars et al.

Motivation to do so would have been to allow for a discrete reconstruction (see page 180).

7. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system as applied to claim 46 above, and further in view of Kitayoshi (US 5974178).

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As per claim 49, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system fails to disclose reconstructing a segment of the original data.

However, Kitayoshi teaches such a method (see columns 4 and 5).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to reconstruct the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system's data using segments.

Motivation to do so would have been to allow for faster computational holography (see column 4 lines 27-31).

8. Claims 88-90, are rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system alone or in combination with Tan et al as applied to claims 10, 23, 81, above, and further in view of Ladino ("Data Compression Algorithms").

As per claims 88-90, the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system discloses distributing the hologram to remote locations (see Jackson column 11 lines 10-28).

The modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system fails to disclose compressing and

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decompressing the hologram on respective ends of the transmission.

However, Ladino discloses compression of data (see pages 1-6).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Ladino's method of data compression to compress the holograms of the modified Jackson, Heanue et al, Yamaguchi et al, and Rentzepis et al system.

Motivation to do so would have been that compressed data uses less space (see Ladino page 2).

Response to Arguments

9. Applicant's arguments with respect to claims above have been considered but are moot in view of the new ground(s) of rejection.

10. Applicant's arguments filed 06/08/2006 have been fully considered but they are not persuasive. Applicant argues that Yamaguchi fails to disclose the specified equation. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA

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1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Allowable Subject Matter

11. Claims 29, 31-45, 50-53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Regarding claims 29, 31-37, 40-45, the prior art teaches generating decryption keys for this type of system, but not the specific keys of claims 29 and 31. Claims 32-37 and 40-45 depend on either claim 29 or 31.

13. Regarding claims 38-39, the prior art teaches

$\phi_E(x,y) = \arctan\left(\frac{I_4 - I_2}{I_1 - I_3}\right)$ as seen in Yamaguchi et al, but fails to

teach the specific equation $A_E(x,y) = \frac{1}{4} \left[(I_1 - I_3)^2 + (I_4 - I_2)^2 \right]^{1/2}$.

14. Regarding claims 50-53, the prior art teaches reconstruction using segments but fails to teach the specific segment defined by the rectangle described in claim 50. Ford et al "Array interconnection by phase-coded optical correlation" teaches the use of the rectangle function within the art, but

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not within the context of claim 50. Claims 51-53 are dependent from claim 50.

15. Claims 143-160 allowed based on placing previously presented claims 29, 31, and 50 in independent form with claims, which depend from them. Reasons for allowance were given in the previous action.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Cohn et al (US 6248487) discloses a system for random phase encoding in holography.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Pyzocha whose telephone number is (571) 272-3875. The examiner can normally be reached on 7:00am - 4:30pm first Fridays of the bi-week off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Emmanuel Moise can be reached on (571) 272-3865. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJP


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